Nutrient and Energy Optimization Study
City of Dyer Wastewater Treatment Plant
Dyer, Tennessee

Tennessee Association of Utility Districts

with funding from the **Tennessee Department of Environmental Conservation, State Revolving Fund Loan Program** and support from **Grant Tech, Inc.** and the **City of Dyer**

Introduction

Tennessee Plant Optimization Program (TNPOP) assists water and wastewater utilities in achieving energy efficiency and nutrient optimization through low-and-no-cost measures. TNPOP is a free program operated by the Tennessee Department of Environment and Conservation (TDEC), Division of Water Resources (DWR). The program provides resources to support water and wastewater operators in achieving optimization in energy use and nutrient removal for their facilities through low-and-no-cost measures.

Acknowledgements

The following study was made possible through funding from the Department of Environment and Conservation (TDEC), Tennessee Division of Water Resources (DWR) State Revolving Fund Loan Program with a TDEC/SRF/TAUD contract. The lead technician for this study was TAUD Senior Wastewater Specialist Dewayne Culpepper. Special ***Thank You*** to the City of Dyer Mayor Chris Younger, City Recorder Nathan Reed, Dyer WWTP operator Tracy Cole, Dyer Public Works Director Randy Gregory (retired), Grant Weaver of Grant Tech, Inc., and TDEC's Karina Bynum.

Summary of Findings

Preceding the optimization effort described in this report, the Dyer staff in 2017 (after attending TDEC's seminars on nutrient removal with Grant Weaver) implemented strategies to optimize treatment plant performance. As a result of the initial optimization efforts, Dyer's oxidation ditch was already providing a high-quality effluent. To maintain and improve performance, the optimization team worked with Dyer's enthusiastic new staff to achieve even better results.

Beginning February 2022, a sixteen-month optimization effort resulted in further improvements to the performance of Dyer's municipal wastewater treatment facility. During this time, the new management and operators benefited from the Tennessee Plant Optimization Program (TNPOP) through the extensive hands-on training regarding process control to achieve nutrient removal. The discharge of conventional pollutants is relatively unchanged. Effluent BOD remains at 3 mg/L. Effluent TSS is now averaging 6 mg/L; it was 8 mg/L prior to the onset of optimization efforts.

In the last few months of the most recent optimization efforts, a significant drop in nutrient concentrations was realized. The total Nitrogen concentration in the treated effluent is now trending at 3-6 mg/L versus an historical average of 10 mg/L. The total Phosphorus concentration, historically around 1.0 mg/L, is now closer to 0.5 mg/L.

Concurrent with the water quality improvements, electrical savings of approximately 10% are being realized. This is a result of optimization changes to reduce the run time for the plant's two 50 HP oxidation ditch aeration rotors. At study's onset, the two aeration rotors operated for a combined total of 19.75 hours per day. They were off for a combined total of 28.25 hours. At study's end, the combined run time was 13.5 hours with a combined off time of 34.5 hours.

To dial in performance, frequent in-house monitoring of effluent ammonia, nitrate, and orthophosphate were performed. Using these data, the on/off cycles of the aeration were changed to maintain ammonia-nitrogen removal while reducing nitrate-nitrogen concentration. And to provide sufficiently septic conditions to energize the microbes that remove phosphorus followed by strongly aerobic conditions in which to biologically remove phosphorus. A number of adjustments were made over the course of the 16-month study. And, unbeknownst to all, a timer malfunction resulting in more aeration than desired from November 2023 until April 2024. After fixing the timer on the West Aerator such that the aerator was, as programmed, not operating from 2 AM to 6:30 AM daily, treatment improved rapidly and markedly.

In conclusion, the Dyer WWTP now has documented nutrient optimization abilities of the plant, design limitations and infrastructure improvement needs. TNPOP optimization program has so far shown successful improvements in constant total-phosphorus nutrient reduction, a years-long decline in electrical use, and potential energy savings promoting a more efficient operating plant and a high-quality treated effluent to protect public health and for the environment to enjoy.

Comments on Dyer's unique Wastewater System

The Dyer wastewater treatment plant was built in 1982 using a unique design using a shallow oxidation ditch, 5.5 feet depth, with a length of 300 ft. The final clarifiers are 12 feet in depth with an experimental design. The clarifiers do not slope to a center well for collection of the biomass to return to the process. The clarifier bottoms are flat using sludge collector piping with sludge suction orifices located throughout the length of the piping.

The Dyer wastewater treatment plant has no digesters or holding tanks for storage, dewatering and stabilizing the wasted sludge. The sludge digesters were cut out of the project in 1982 due to insufficient funding. Not having a sludge disposal or sludge digestion and dewatering system is unheard of in activated sludge treatment design. In the 1980's, there were grant monies to fund new "experimental or innovative" designs of wastewater treatment plants. Dyer's facility was built using these funds.

The Dyer WWTP utilizes the farmland and/or turf fields for land application of their biosolids for disposal. Sludge is pumped from the bottom of the final clarifiers to drying beds, dewatered, and land applied to a sod field. The biosolids are annually tested (SOUR test) for compliance with the Federal 40 CFR 503 requirements for disposal of the biosolids.

The Dyer sewer collection system infrastructure is aged and has significant Inflow and infiltration (I/I) at greater than 60%. I/I have a detrimental impact on the collection system components and the wastewater treatment process control causing violations with federal and state permits.

The NPDES Permit parameters for Dyer now include much lower stringent limits for effluent BOD, Total Chlorine and Ammonia as N. The permit also has Total Phosphorus and Total Nitrogen limits. These changes are pushing the existing treatment plant to its design limits or more.

Recommendations

In light of the above, the following shortcomings merit attention.

- An on-going investment in identifying and correcting Dyer's significant Collection System Inflow and Infiltration.
- Further improvements to Dyer's sludge handling system. A sludge screw press is soon to be installed however there is no sludge storage tank from which the sludge will be pumped. At a minimum, sludge storage is required for biosolids stabilization.
- Flow proportion-controlled bleach disinfection injection system or UV disinfection system. With a total chlorine monthly average permit limits of 0.011 mg/l at the detection limits of analysis equipment capability, using a chemical disinfection system may be at its limitations for consistence permit compliance regarding impacts from flow and loading variations.
- An investment in in-line instrumentation and control systems to further optimize aeration rotor performance.

Utility Information

City of Dyer Water & Sewer
Mayor: Chris Younger (Newly elected and seated as of 01/01/2023)
City Recorder: Nathan Reed
nreed@cityofdyertn.com
(731) 692-3767

Dyer City Hall
105 South Main Street
Dyer, TN 38330

WWTP Operator Information:
Tracy Cole
Grade III WWTP Certification
tcole@cityofdyertn.com
731-697-7881 cell

WWTP Plant Information

Dyer WWTP – Permit # TN0021563
978 Wastewater Customers.
34 miles of sewer collection lines.
Inflow / Infiltration = 65%

City of Dyer is authorized to discharge treated municipal wastewater from Outfall 001 to Sand Creek at mile 1.6 from a treatment facility with a design capacity of 0.675 MGD. The biological process is an extended aeration activated sludge (oxidation ditch), with two clarifiers and chlorine disinfecting. Tennessee Water Resources Permit information site:

https://dataviewers.tdec.tn.gov/dataviewers/f?p=2005:34051:33322530495641:::34051:P34051_PERMIT_NUMBER:TN0021563

The WWTP plant's physical address is:

199 BECTON DRIVE
DYER, TN 38330
36.072417, -89.00507

Wastewater Treatment Plant characteristics

This Oxidation Ditch is an experimental design from 1982 with only a **5.5 feet of depth of biomass**
Oxidation Ditch with a design capacity of .675 MGD.
Oxidation Ditch has a volume of 0.49 MG
Oxidation Ditch has two 50 hp rotary aerators
Oxidation Ditch Effluent flow splits to two clarifies.
Each Clarifier has a volume of 0.113 MG
Average Year-round Influent flow: 0.43 MGD
WAS ?????? gallons 3 to 4 / week based on the desired MLSS

Average 2017 -2021 Influent/Effluent parameters:

Average Influent Flow: 0.43 MGD; Max flow: 2.16 MGD
Influent BOD: 50.00 mg/L; Effluent BOD: 3.0 mg/L
Influent TSS: 176.35 mg/L ; Effluent TSS : 4.44 mg/L
Influent PH; 7.00 s.u.; Effluent PH; 7.05 s.u.
Influent Ammonia NH^3: 22 mg/L ; Effluent Ammonia NH^3: < 0.3 mg/L
Effluent TN: 8.84 (This data is the current average since August 2022 through December 2022)
Effluent TP: 2.92 (This data is the current average since August 2022 through December 2022)

Average 2022 summer wastewater parameters (May – October):

Average Influent flow: 0.34 MGD; Max flow: 0.8 MGD; Min flow: 0.19 MGD
Influent BOD: 60 mg/L; Effluent BOD: 2.74 mg/L
Influent TSS : 130 mg/L ; Effluent TSS : 6.38 mg/L
Influent PH ; 7.08 s.u.; Effluent PH ; 7.05 s.u.
Influent Alkalinity: 100 mg/L
Effluent Alkalinity: 45 mg/L

Operating Process Control Parameters:

Average MLSS: 3300
Volatile Solids Content : 50%
Average MLVSS : 1650
Average F/M: 0.026
Average SVI 78.0
MCRT 28 – 30 DAYS

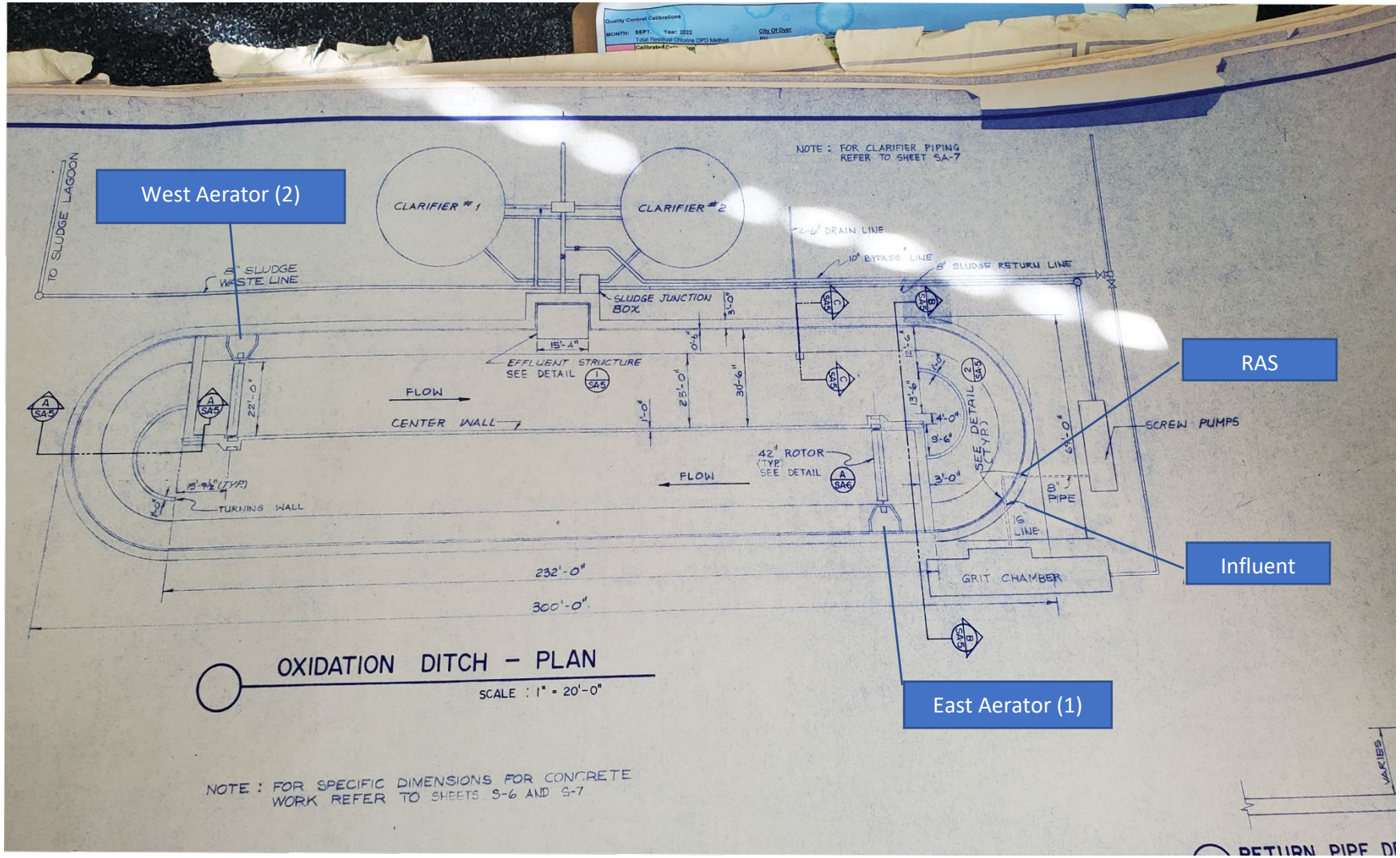
Dyer WWTP Current Process Control

The Dyer Activated Sludge Oxidation Ditch was designed and built in 1982. The design of the Oxidation Ditch was unique in that it is only 5.5 feet deep at normal conditions of hydraulic loading resulting in an average 27-hour detention time. The Oxidation Ditch effluent MLSS flow is split traveling to two clarifiers (12 ft deep) for sedimentation. The clarified effluent flows to the chlorine contact chamber for disinfection and dichlorination.

There is no Sludge digestion! The wasted sludge is sent directly to sludge drying beds and / or dewatering box.

The wastewater treatment plant process has been set up for on and off aeration to attempt nutrient removal for TN and TP. The following is the current schedule for the east aerator (1), and west aerator (2).

East Aerator (1)			West Aerator (2)		
On	Off	Total Hrs.	On	Off	Total Hrs.
6:30 am	9:45 am	3.25	6:30 am	10:30 am	4.0
12:30 pm	2:30 pm	2.0	1:00 pm	2:50 pm	1.83
6:00 pm	8:00 pm	2.0	8:50 pm	10:30 pm	1.67
1:00 am	3:30 pm	2.5	12:00 am	2:30 am	2.5
Total aeration time		9.75			10.00



Dyer WWTP Schematic

Dyer Oxidation Ditch – East Rotor

Both the RAS and Influent raw wastewater plant flow enters the oxidation ditch immediately prior to the East Aerator location. Both aerators, 50 HP each, have soft starts and electronic timers. There is no SCADA system control or on-line DO sensors in the oxidation ditch. Currently average effluent TN is 8.2 mg/L and average effluent TP is 2.3 mg/L.

Operations Personnel TNPOP Training

At the start of the TNPOP study, there was a newly hired operator, Tracy Cole in training and one Grade III certified operator, Randy Gregory (Water & Wastewater Supervisor) on-site daily. Randy Gregory retired shortly after the study began. All laboratory equipment and reagents for TP, TN, Ammonia as N, Total Alkalinity, Nitrate and Nitrate have been supplied by TAUD. Training to perform all analysis has been completed. The operators were supplied and /or already have portable DO and ORP equipment and trained to complete analysis/sampling. The implementation of TDEC EMOR and training for monthly reporting is complete and active.

Official Dyer WWTP TNPOP Process Review and Initial Process Adjustments

February 2, 2023

The official on-site meeting with Dyer Utilities, TAUD and Grant Weaver on February 2,2023. Grant Weaver attended the meeting via Microsoft Teams. The current process control, historical & current NPDES compliance data was reviewed. Recommended new schedule, for rotor on – off aeration, was implemented to both rotor's aeration controls. Recommended process control testing was implemented to check the ditch effluent MLSS for Ammonia, Nitrate, ortho phosphorous, ph and alkalinity. After a new process set up is established, ORP analysis will be conducted during aeration and off-aeration cycles in several areas of the ditch. The main focus was adjusting on/off sequences of the rotors to mirror each other with the exception of a 30-minute difference between the two rotors to prevent higher electric demand charges. The total time for on-aeration is 10 hours with total time of off-aeration of 14 hours.

02/02/2023 – Dyer Summary Email from Dewayne Culpepper.

Good Evening Grant,

Enjoyed the meeting today as it was very productive. Randy reprogrammed the timers, and we are now using the new On/Off aeration cycles. I plan to return to Dyer next week, Wednesday, and run some test. Also, Tracey does perform PH on MLSS Daily. The MLSS PH is 7.02 or better on every test that I looked up, so we are good there! Well, see you Tuesday and until then stay healthy and safe!

Sincerely,

Dewayne T. Culpepper

Dyer Process Control Data 03/09/2023

The month of February had weather related issues that influenced the plants process, so the first good week for process control sampling was the week of March 6 – 10. There was also a clarifier with a RAS return line stoppage which required taking a clarifier out of service for maintenance during the last week of February. So, on March 9th, samples for Ditch Effluent laboratory Analysis were grabbed at 11:45 am after the ditch aeration was off for 3.25 hours. ORP Readings were taken after the ditch aeration was off between 2.75 to 3.5 hours (see page 2). Denitrification gasification was noted to appear after 2.75 hours during off aeration cycle in certain areas of the ditch. Most notable denitrification was 50 to 60 feet down from the east rotor and then 50 feet down from west rotor right before the ditch's MLSS effluent structure. The following are results from the analysis of the ditch effluent grab sample at 11:45 am when ditch was off for 3.25 hours:

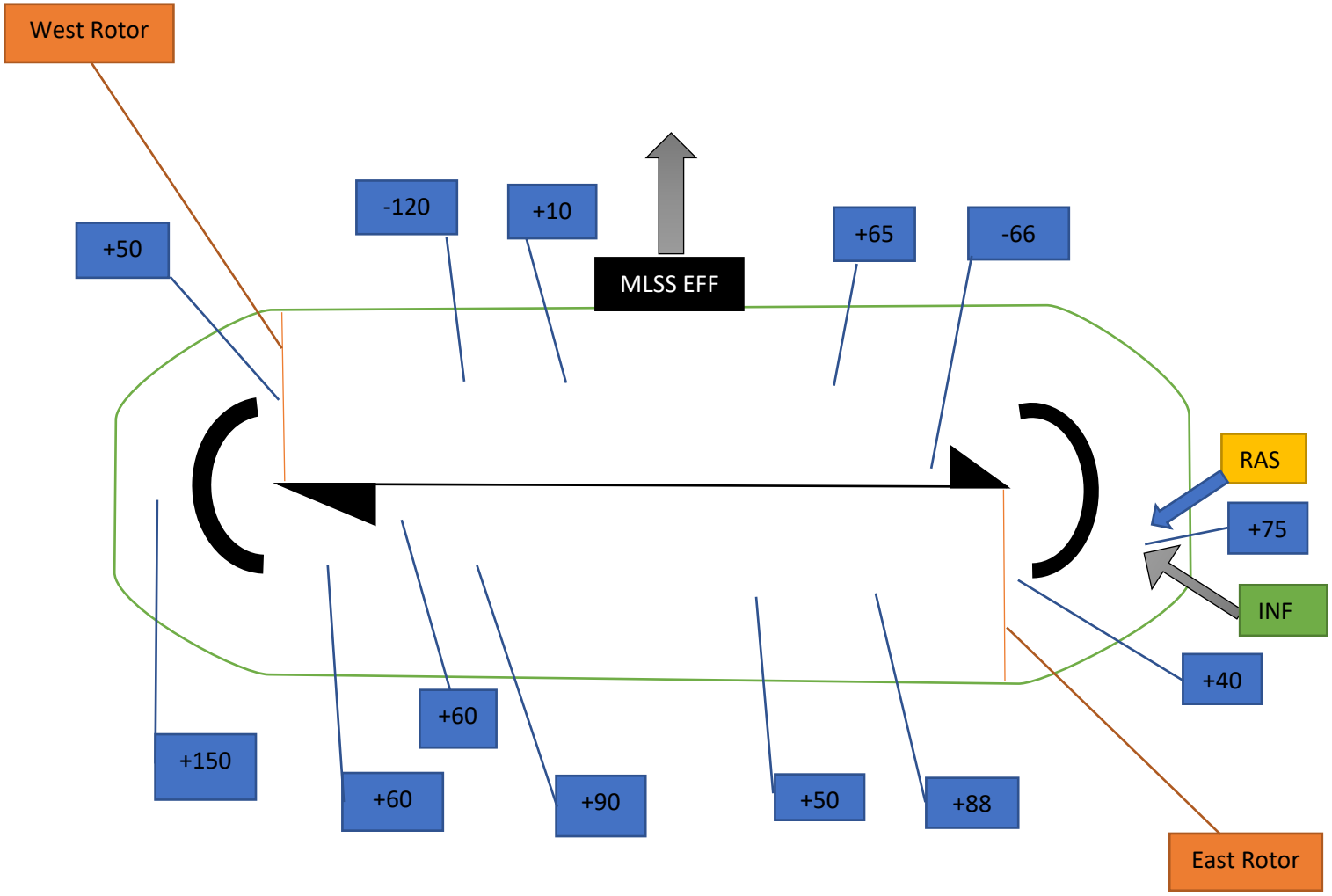
Ditch Effluent Sampling11:45 am (when ditch was off for 3.25 hours)
Ditch MLSS temperature : 13.5 to 14.0 C
Ditch Eff Ammonia NH^3 : 0.98 mg/L
Ditch Eff Nitrate – Nitrite: 4.98 mg/l
Ditch Eff Total Phos (TP): 0.464 – (Ortho method in TP reading)
Ditch MLSS 3100 mg/L – 50% Volatile solids = MLVSS 1550 mg/L
Ditch PH : 7.16 – 7.2 S.U.

Ditch DO **when in ON-Aeration Cycle**: >3.0 mg/L

Plant Effluent (regular composite test the same day of sampling ditch)
Plant Eff Alkalinity : 60 mg/L
Plant Eff NH^3 : 0.198 mg/L =

Plant Effluent Monthly averages
Average Eff BOD: 2.6 mg/L
Average Eff TSS: 4.8 mg/L
Average Eff Ammonia NH^3 : 0.16 mg/L

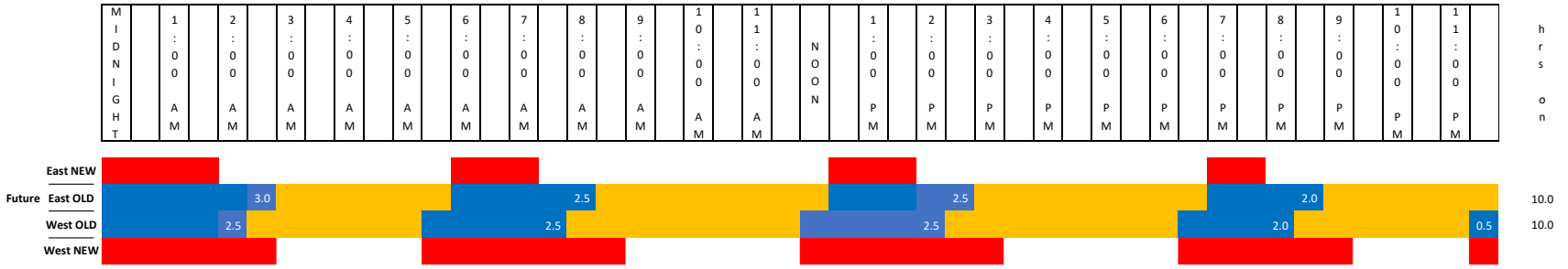
Dyer ORP Readings at 3.5 hours into air-off cycle



Dyer WWTP TNPOP Process Review and Follow Up Process Adjustments

March 17, 2023

The follow up on-site meeting with Dyer Utilities, TAUD and Grant Weaver was conducted on March 17,2023. Grant Weaver attended the meeting via Microsoft Teams. The current process control, current NPDES compliance data was reviewed. Recommended new schedule, for rotor on – off aeration, was implemented on March 20th, 2023, to both rotor's aeration timer controls. Continuing process control testing to check the ditch effluent MLSS for Ammonia, Nitrate, ortho phosphorous, ph and alkalinity to monitor results from new aeration schedule. After a new process set up is established, ORP analysis will be conducted during aeration and off-aeration cycles in several areas of the ditch. A follow up meeting is planned on April 18th, 2023, to review process updates. The following is the new aeration schedule to be implemented.



04/10/2023 On-Site Visit - Progress Visit

WWTP optimization of aeration rates and on/off schedule have been suspended due to waste sludge from the water plant that has been sent to the WWTP causing a high MLSS of >4500 with less than 50% volatile solids. The wasting sequence for the Dyer WWTP is to run both aerators continuously to mix oxidation ditch so MLSS is carried to the clarifiers and settled while in wasting mode. Solids are sent directly to sludge drying beds. Until the MLSS is down to correct level, optimization of plant aeration is on hold. During this set back, the effluent parameters for ammonia are still low, <0.1 mg/L.

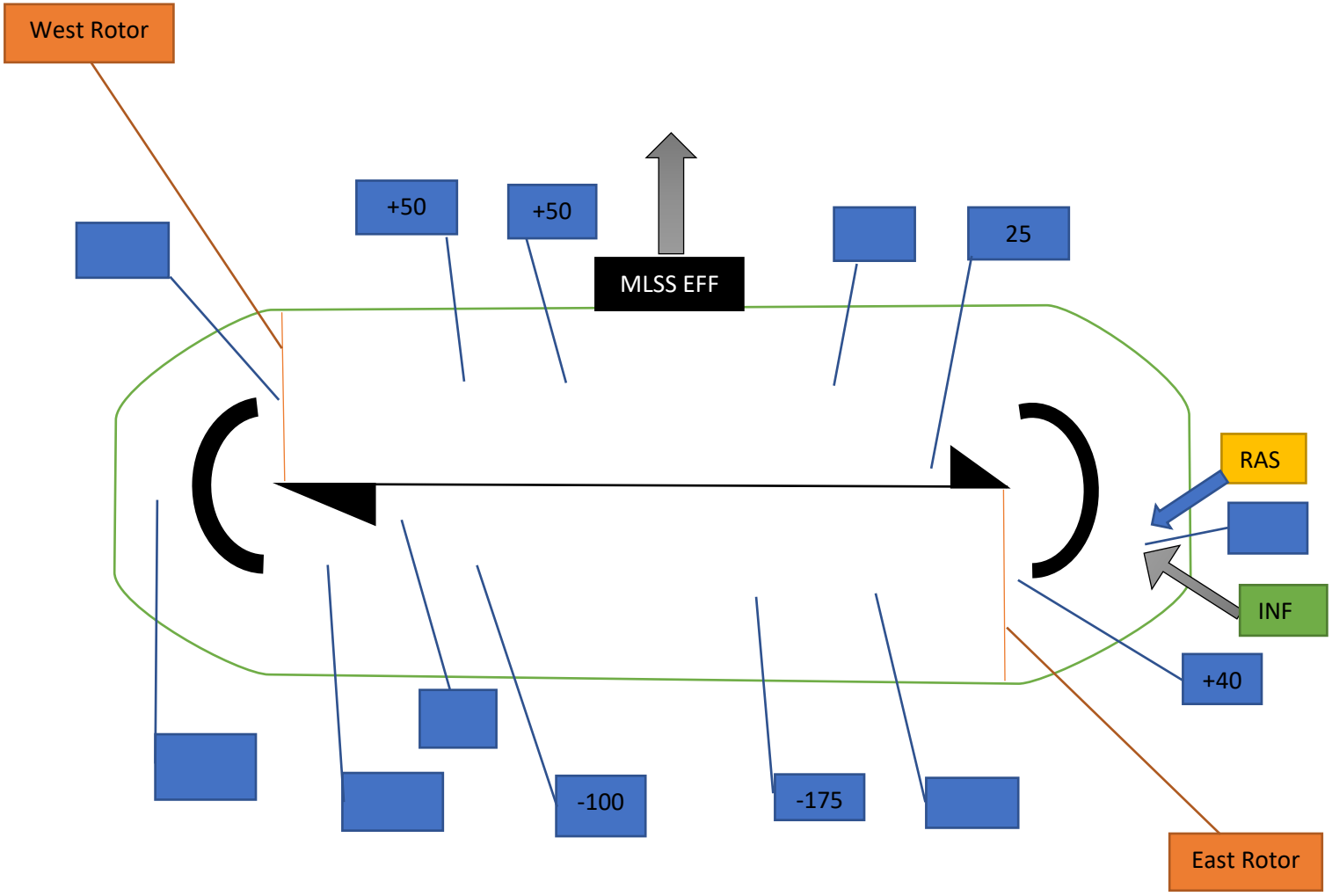
04/19/2023 On-Site Visit - Progress Visit

The WWTP continues to operate in a waste mode to achieve a lower MLSS. WWTP optimization of aeration rates and on/off schedule had been cut off during the **hours of 7:00 am to 3:00 pm** due to waste sludge from the water plant has been sent to the WWTP causing a high MLSS of >4500 with less than 50% volatile solids. During the rest of the day and night the timers are on to promote optimization. This will continue for about another 2 weeks. Sampling will continue. Canceled virtual meeting with Grant and rescheduled for June 1st, at 9 am.

05/9/2023 On-Site Visit - Progress Visit

Training Tracy Cole on completing both April 2023 State EMOR report and EPA NetDMR report. Tracy achieved his State Certification and acquired a Grade III Wastewater Treatment Plant license! Assisted Trace in registering for an EPA Signatory Net DMR account. Wastewater treatment PLANT was observed and meeting all expectations from the optimization adjustments that is now fully engaged. On- Off aeration rates are now applied since wasting of excess solids has been achieved. ORP readings were measured in several locations in the oxidation ditch with great results. Sludge blanket is now settling 50 – 70 feet west from the (east rotor) and influent flow!

Dyer ORP Readings at 2.75 hours into air-**off** cycle at 11:45 am.



On-Site Visit - Progress Visit 05/23/2023

On-site visit with Tracy Cole performing process control sampling and analysis of Effluent TP, Effluent Nitrate, Influent Ammonia and ORP measurements in the Oxidation ditch. Wastewater treatment PLANT was observed and meeting all expectations from the optimization adjustments that is now fully engaged. On- Off aeration rates continue with the latest plan. Seasonal changes with warmer temps are noted. ORP readings were measured in several locations in the oxidation ditch with continued great results. During the air- off cycle the oxidation ditch sludge blanket is now settling in two different sections of the Oxidation Ditch. One area is located 50 – 70 feet west from the (east rotor) and a second blanket is settling 50 feet east from the West Rotor. Heavy denitrification was noted in both areas. The following are current results from the current process control:

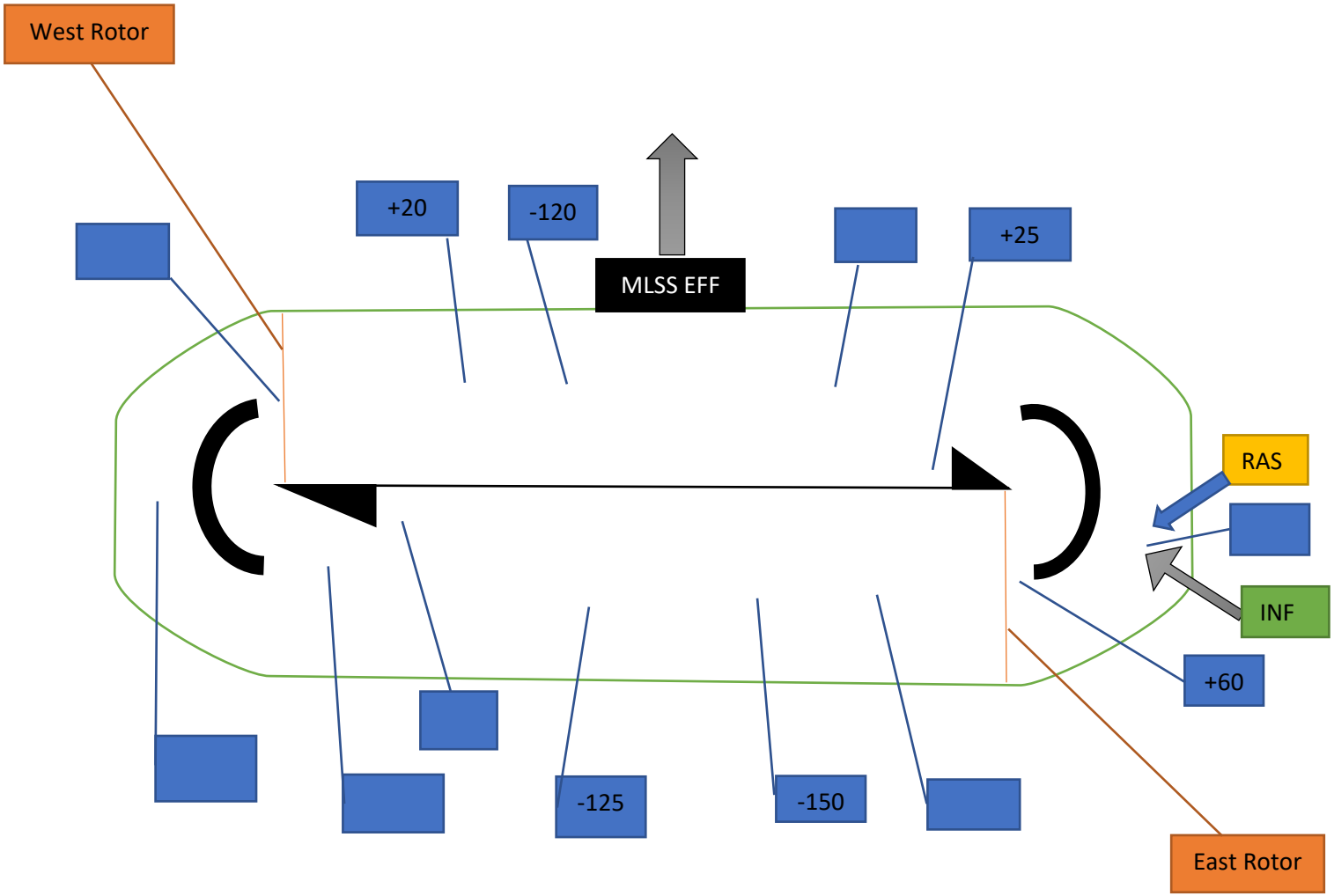
Effluent Sampling – (05/23)
Eff Ammonia NH^3 : < 0.20 mg/L
Eff Nitrate: 7.0 mg/l
Eff TP: 0.30 – (Ortho method in TP reading)

Plant Effluent Monthly averages
Average Eff BOD: 2.0 mg/L
Average Eff TSS: < 5.0 mg/L
Average Eff Ammonia NH^3 : < 0.2 mg/L
Average Eff Nitrate: < 7.0 mg/l
Average Eff TP: < 0.80

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: >3.0 mg/L
Ditch MLSS temperature: 21.2 C
Ditch MLSS 2100 mg/L – 62% Volatile solids = MLVSS 1302 mg/L
Ditch PH : 7.16 – 7.2 S.U.

The following schematic is ORP readings conducted on 05/23/2023.

Dyer ORP Readings at 2.5 hours into air-off cycle at 11:30 am. Ditch Temp at 21.2 C.



Dyer WWTP TNPOP Process Review and Follow Up Process Adjustments

June 06, 2023

The scheduled follow up on-site meeting with Dyer Utilities, TAUD and Grant Weaver was conducted on June 06,2023. Grant Weaver attended the meeting via Microsoft Teams. The current process control, current NPDES compliance data was reviewed. It was noted that the effluent TP was very low < 0.4 mg/L. Continuing process control testing to check the ditch effluent MLSS for Ammonia, Nitrate, ortho phosphorous, ph and alkalinity to monitor results will continue. The water plant sedimentation basin sludge and filter backwash discharge to the WWTP was discussed. The water plant sludge consists of high Iron and uses an aluminum-based PAC polymer used for coagulation and settling. It was determined that the WWTP influent high Iron and aluminum-based PAC polymer used for coagulation and settling at the water treatment plant, contributes to the low effluent TP – Chemical removal. The recommended schedule, for rotor on – off aeration, that was implemented on March 20th, 2023, will continue. All agreed to continue with the present optimization set up throughout the summer months with sampling and data collection unless a parameter makes a change for the worse. Until needed, no virtual meeting was scheduled. The following are current results from the current process control:

Effluent Sampling – (05/23)
Eff Ammonia NH^3 : < 0.20 mg/L
Eff Nitrate: 7.0 mg/l
Eff TP: 0.30 – (Ortho method in TP reading)

Plant Effluent Monthly averages
Average Eff BOD: 2.0 mg/L
Average Eff TSS: < 3.0 mg/L
Average Eff Ammonia NH^3 : < 0.2 mg/L
Average Eff Nitrate: < 7.0 mg/l
Average Eff TP: < 0.40

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: >4.0 mg/L
Ditch MLSS temperature : 22.2 C
Ditch MLSS 2100 mg/L – 53% Volatile solids = MLVSS 1113 mg/L
Ditch PH : 7.16 – 7.2 S.U.

On-Site Visit - Progress Visit - 06/20/2023

On-site visit with Tracy Cole performing process control sampling and analysis of Effluent TP, Effluent Nitrate, Influent Ammonia in the Oxidation ditch. Wastewater treatment PLANT was observed and meeting all expectations from the optimization adjustments that is now fully engaged. On- Off aeration rates continue with the latest plan. Seasonal changes with warmer temps are noted. TN was noted creeping up and alkalinity is low at 35 mg/L. The following are current results from the current process control:

On-site Effluent Sampling – (06/20)
Eff Ammonia NH^3 : 0.20 mg/L
Eff Nitrate: 9.10 mg/l
Eff TP: 0.82 – (Ortho method in TP reading)
Eff Alkalinity: 35 mg/L
Plant Effluent Monthly averages
Average Eff BOD: 2.0 mg/L
Average Eff TSS: < 3.0 mg/L
Average Eff Ammonia NH^3 : 0.2 mg/L

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: 3.0 mg/L
Ditch MLSS temperature : 25.2 C
Ditch MLSS 2200 mg/L – 53% Volatile solids = MLVSS 1166 mg/L
Ditch PH : 7.16 – 7.2 S.U.

Monthly Contract Lab Results

Eff TP: < 0.08 mg/L
EFF TKN: 10.7 mg/L
Eff N-N : 9.32

On-Site Visit - Progress Visit - 07/08/2023

On-site visit with Tracy Cole performing process control sampling and analysis of Effluent TP, Effluent Nitrate, Effluent Ammonia in the Oxidation ditch. The main pump station has had some work performed on it and the pump station has been set to pump down to a lower level. This is one of the initial recommendations and now is completed. The influent wastewater no longer surcharging into the collection system with influent BOD's consistently coming in around 150 mg/L. The plant has changed somewhat and plan to discuss this with Grant during an upcoming virtual meeting. Wastewater treatment PLANT was observed and meeting all expectations from the optimization adjustments that is now fully engaged. On- Off aeration rates continue with the latest plan. TN was noted creeping up and alkalinity is low at 40 mg/L. The following are current results from the current process control:

On-site Effluent Sampling – (06/20)
Eff Ammonia NH^3 : 0.32 mg/L
Eff Nitrate: 9.88 mg/l
Eff TP: 0.788 – (Ortho method in TP reading)
Eff Alkalinity: 40 mg/L

Plant Effluent Monthly averages
Average Eff BOD: 2.0 mg/L
Average Eff TSS: < 3.0 mg/L
Average Eff Ammonia NH^3 : 0.3 mg/L

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: 2.4 mg/L
Ditch MLSS temperature : 26.2 C
Ditch MLSS 2500 mg/L – 50% Volatile solids = MLVSS 1250 mg/L
Ditch PH : 7.16 – 7.2 S.U.

Dyer WWTP TNPOP Process Review

July 10th, 2023

The scheduled follow up on-site meeting with Dyer Utilities, TAUD and Grant Weaver was conducted on July 10, 2023. Grant Weaver attended the meeting via Microsoft Teams. The current process control, current NPDES compliance data was reviewed. During the meeting, several items was discussed as follows:

1) Main Influent Pump Station Adjustments
The main influent pump station lower pumping level controls were adjusted to 10 inches lower to correct the surcharging of the influent interceptor sewer to the wastewater treatment plant. Previously Influent BODs before the adjustment were in the 60 mg/l and after the adjustments the influent BODs are consistently around 120 to 180 mg/L. This adjustment will have a positive impact on optimization of the process control of the plant.

2) NPDES Permit Annual Rolling Averages for TN and TP results
The new annual rolling average reporting limits for the NPDES permit are approaching in August 2023. This will be the 13th month into the new NPDES permit and TN and TP annual rolling averages will begin to be reported. The plant is meeting TN and TP parameters for mg/L and pounds limits.

3) Continuing Optimization
Continuing process control testing to check the ditch effluent MLSS for Ammonia, Nitrate, ortho phosphorous, ph and alkalinity to monitor results will continue. The recommended schedule, for rotor on – off aeration, that was implemented on March 20th, 2023, will continue. All agreed to continue with the present optimization set up throughout the summer months with sampling and data collection unless a parameter makes a change for the worse. The main focus is to keep TP below 1.0 mg/L while keeping a close eye on effluent Ammonia NH^3 compliance of <0.5 mg/L. Until needed, no virtual meeting was scheduled. The following is an email from Gran summing up the meeting regarding effluent parameters:

Tracy & Dewayne (w cc to Karina),

Great news.
Dyers' nutrient numbers are good to excellent.

Ammonia consistently meets permit even with tight limits.
Total-Phosphorus is easily meeting permit and remaining low during summer months with the process changes.
Total-Nitrogen is also easily meeting permit although concentrations are higher than what we'd like to see.

Dyers' most recent effluent concentrations follow ...
total-Phosphorus ... less than 0.9 mg/L or less
0.79 mg/L (7/8/23)
0.82 mg/L (6/20/23)
< 0.40 mg/L (5/23/23)
Ammonia-Nitrogen ... less than 0.35 mg/L
0.32 mg/L (7/8/23)
0.20 mg/L (6/20/23)
< 0.20 mg/L (5/23/23)
Nitrate-Nitrogen ... less than 10 mg/L
9.9 mg/L (7/8/23)
9.1 mg/L (6/20/23)
7.0 mg/L (5/23/23)

Dyers' effluent **Ammonia limit is 0.5 mg/L**.

At current flows of 0.43 MGD, Dyers' effluent needs to be at or below the following concentrations to comply with annual rolling total-Phosphorus and total-Nitrogen limits ...
total-Phosphorus: 2.6 mg/L
total-Nitrogen: 21 mg/L

At a design flow of 0.675 MGD, Dyers' effluent needs to be at or below the following concentrations to comply with annual rolling total-Phosphorus and total-Nitrogen limits ...
total-Phosphorus: 1.7 mg/L
total-Nitrogen: 13.4 mg/L

Grant

Grant Weaver, PE & Wastewater Operator
President

On-Site Visit - Progress Visit - 07/18/2023 – Updated with TN & TP Contract Lab Results

On-site visit with Tracy Cole performing process control sampling and analysis of Effluent TP, Effluent Nitrate, Effluent & Influent Ammonia and ORP in the Oxidation ditch. On- Off aeration rates continue with the latest plan. Official TN and TP sample results conducted by contract lab and sampled on 7/12 were, TN 8.6 mg/L and TP 0.6 mg/L. Effluent alkalinity is low at 40 mg/L in the final effluent. As we sampled the ditch for ORP readings it was noted the inner circle area of the ditch (all the way around) had positive ORP readings while the outer circle area of the ditch had negative ORP readings. This showed the settling characteristic of the MLSS in the oxidation ditch. The following are current results from the current process control:

On-site Influent Sampling
Inf Ammonia as NH^3 : 22.0 mg/L
Inf BOD : 140 mg/L

Contract Lab Results – Samples (07/12)
Effluent TN: 8.6 mg/L
Effluent TP: 0.6 mg/L

On-site Effluent Grab Sampling – (07/18)
Eff Ammonia NH^3 : 0.25 mg/L
Eff Nitrate: 9.29 mg/l
Eff TP: 1.3 mg/L – (Ortho method in TP reading)
Eff Alkalinity: 40 mg/L

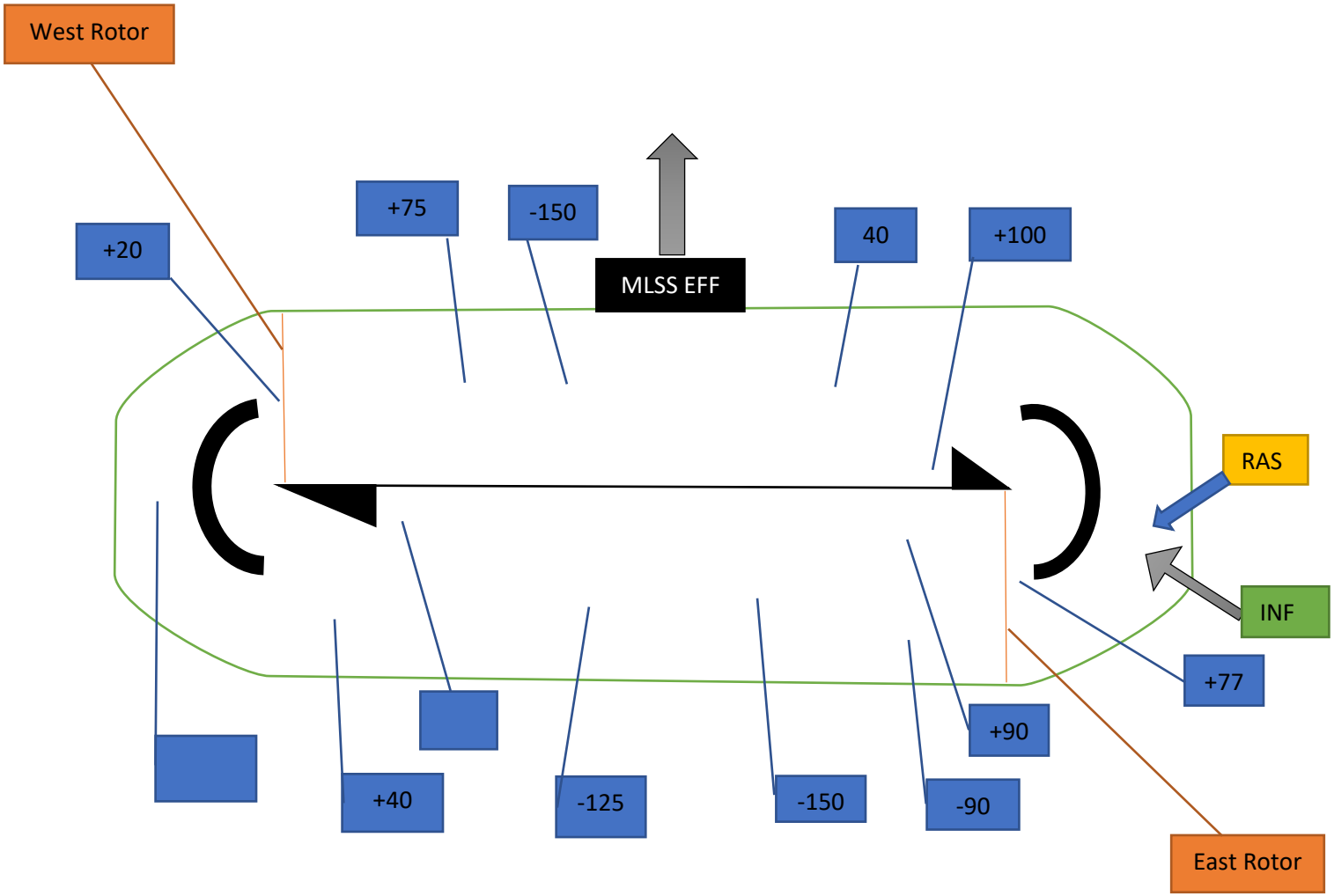
Plant Effluent Monthly averages
Average Eff BOD: <2.0 mg/L
Average Eff TSS: < 3.0 mg/L
Average Eff Ammonia NH^3 : 0.2 mg/L

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: 2.5 mg/L
Ditch MLSS temperature : 26.0 C
Ditch MLSS 2500 mg/L – 50% Volatile solids = MLVSS 1250 mg/L
Ditch PH : 7.16 – 7.2 S.U.

The following schematic is ORP readings conducted on 07/18/2023

The following schematic is ORP readings conducted on 07/18/2023.

Dyer ORP Readings at 2.5 hours into air-off cycle at 11:30 am. Ditch Temp at 26.0 C.



On-Site Visit - Progress Visit - 08/15/2023

On-site visit with Tracy Cole reviewing process control and contract lab analysis of Effluent TP, Effluent TN, and Effluent Nitrate. On-Off aeration rates continue with the latest plan. Official TN and TP sample results conducted by contract lab and sampled on 8/8/2023 were TN 6.60 mg/L, TP 0.420 mg/L, and TKN <0.5. Ammonia NH^3 is < 0.2 mg/L. The MLSS is 2500 mg/L and MLVSS is 1400 mg/l. So far, if the plant continues this performance, we will have outperformed the previous year's data for TN and TP. The focus with the current process control is to keep TP below 1.0 mg/L while keeping a close eye on effluent Ammonia NH^3 compliance of <0.5 mg/L.

Also, during the visit, all state and federal reports were generated, reviewed, and submitted. Tracy has now mastered this task.

On-Site Visit - Progress Visit – 09/28/2023

On-site visit with Tracy Cole reviewing process control and contract lab analysis of Effluent TP, Effluent TN, and Effluent Nitrate. **TAUD purchased all process control HACH TNT chemistries and replenished supplies to Dyer to conduct on-site process control analysis.** On- Off aeration rates continue with the latest plan. Official contract laboratory TN and TP sample results conducted on 9/6/2023 were TN 9.5 mg/L, and TP 0.9 mg/L, and TKN <0.5. Ammonia NH^3 is < 0.2 mg/L. The MLSS is 2000 mg/L and MLVSS is 1000 mg/l. The focus with the current process control is to keep TP below 1.0 mg/L while keeping a close eye on effluent Ammonia NH^3 compliance of <0.5 mg/L. On-site laboratory analysis was conducted on the week of 09/28/2023. The following are results from the current process control:

Contract Lab Results – Samples (09/06)
Effluent TN: 9.5 mg/L
Effluent TP: 0.9 mg/L

On-site Effluent Grab Sampling – (09/28)
Eff Ammonia NH^3 : 0.28 mg/L
Eff Nitrate: 9.48 mg/l
Eff TP: <0.5 mg/L – (Ortho method in TP reading)
Eff Alkalinity: 30 mg/L

September 2023 Plant Effluent Monthly averages
Average Eff BOD: <2.0 mg/L
Average Eff TSS: 3.1 mg/L
Average Eff Ammonia NH^3 : 0.28 mg/L

Ditch Sampling
Ditch DO **when in ON-Aeration Cycle**: 3.0 mg/L
Ditch MLSS temperature : 19.0 C
Ditch MLSS 2000 mg/L – 50% Volatile solids = MLVSS 1000 mg/L
Ditch PH : 7.1 – 7.2 S.U.

On-Site Visit - Progress Visit – 10/18/2023

On-site visit with Tracy Cole reviewing process control and contract lab analysis of Effluent TP, Effluent TN, and Effluent Nitrate. On-Off aeration rates continue with the latest plan. Official contract laboratory TN and TP sample results conducted on 10/03/2023 were; TN 9.29 mg/L, TP 1.46 mg/L. Ammonia NH^3 is < 0.2 mg/L. The Temperature of the Ditch has dropped to 18˚C and the ditch DO is 3.5 during aeration. May be time to cut back aeration (on) cycles for winter process control. **Tracy and I talked about cutting back 30 minutes on each cycle with the West aerator.** The MLSS is 2500 mg/L and MLVSS is 1250 mg/l. The focus with the current process control is to keep TP below 1.0 mg/L while keeping a close eye on effluent Ammonia NH^3 compliance of <0.5 mg/L. On-site laboratory analysis was conducted on the week of 10/18/2023. The following are current results from the current process control:

Contract Lab Results – Samples (10/03)
Effluent TN: 9.29 mg/L
Effluent TP: 1.46 mg/L

On-site Effluent Grab Sampling – (10/18)
Eff Ammonia NH^3 : 0.28 mg/L
Eff Nitrate: 10.1 mg/l
Eff TP: 1.49 mg/L – (Ortho method in TP reading)
Eff Alkalinity: 20 mg/L

Ditch Sampling – (10/18)
Ditch DO **when in ON-Aeration Cycle**: 3.5 mg/L
Ditch MLSS temperature : 18.0 C
Ditch MLSS 2500 mg/L – 50% Volatile solids = MLVSS 1250 mg/L
Ditch PH : 7.1 – 7.2 S.U.

On-Site Visit - Progress Visit – 11/01/2023

On-site visit with Tracy Cole reviewing process control and lab analysis of Effluent TP, Effluent TN, and Effluent Nitrate. On- Off aeration rates were modified on 10/25/2023 to the West aerator. The East aerator continues with the same schedule implemented on March on March 20th, 2023, but the West aerator on-time was cut by 30 minutes at the end of the on-time schedule for a total of two hours per day. Laboratory TN and TP sample results conducted on 11/01/2023 were TN 9.94 mg/L, TP 1.11 mg/L. Ammonia NH^3 is < 0.12 mg/L. The Temperature of the Ditch has dropped to 14˚C and the ditch DO is 7.0 mg/L during aeration. Cutting the aeration time by 30 minutes on the West aerator has lowered the TP and the effluent NH^3 remains super low. The average MLSS is 3100 mg/L and MLVSS is 1581 mg/l. The focus with the current process control is to keep TP below 1.0 mg/L while keeping a close eye on effluent Ammonia NH^3 compliance of <0.5 mg/L. On-site laboratory analysis was conducted on the week of 11/01/2023. The following are current results from the current process control:

On-site Effluent Grab Sampling – (11/01)
Eff Ammonia NH^3 : < 0.12 mg/L
Eff Nitrate: 9.94 mg/l Eff. Nitrite: < 0.1 mg/L
Eff TP: 1.11 mg/L – (Ortho method in TP reading)
Eff Alkalinity: <10 mg/L
Influent Alkalinity: 90 mg/L

Ditch Sampling – (10/18)
Ditch DO **when in ON-Aeration Cycle**: 7.0 mg/L
Ditch MLSS temperature : 14˚C
Ditch MLSS 3100 mg/L – 51% Volatile solids = MLVSS 1581 mg/L
Ditch PH : 7.1 – 7.2 S.U.

Aeration Schedule as of 11/01/2023

East Aerator (1)			West Aerator (2)		
On	Off	Total Hrs.	On	Off	Total Hrs.
6:00 am	7:30 am	1.5	5:30 am	8:30 am	3.0
12:30 pm	2:00 pm	1.5	12:00 pm	3:00 pm	3.0
7:00 pm	8:00 pm	1.0	6:30 pm	9:00 pm	2.5
12:00 am	2:00 am	2.0	11:30 pm	2:30 am	3.0
Total aeration time		6.0			11.5

Dyer WWTP TNPOP Process Review and Follow Up Process Adjustments

November 13, 2023

The follow up on-site meeting with Dyer Utilities, TAUD and Grant Weaver was conducted on November 13, 2023. Grant Weaver attended the meeting via Microsoft Teams. The current process control, current NPDES compliance data was reviewed. Recommended new schedule, for rotor on – off aeration, was implemented on November 13, 2023, to both rotor's aeration timer controls. Continuing process control testing to check the ditch effluent MLSS for Ammonia, Nitrate, ortho phosphorous, ph and alkalinity to monitor results from new aeration schedule. After the new process set up is established, ORP analysis will be conducted during aeration and off-aeration cycles in several areas of the ditch. The following is the new aeration schedule to be implemented.

Dyer, TN Oxidation Ditch: air-ON cycles

	EAST ROTOR				WEST ROTOR			
	11/13/23	11/1/23	3/20/23	OLD	OLD	3/20/23	11/1/23	11/13/23
MIDNIGHT								
1:00 AM								
		1.5	1.5					
2:00 AM					2.5		2.5	2.5
				3.0		3.0		
3:00 AM								
4:00 AM								
5:00 AM								
6:00 AM								
7:00 AM	1.5	1.5	1.5					
					2.5			
8:00 AM				2.5			3.0	3.0
						3.5		
9:00 AM								
10:00 AM								
11:00 AM								
NOON								
1:00 PM								
		1.5	1.5					
2:00 PM					2.5			
				2.5			3.0	3.0
3:00 PM						3.5		
4:00 PM								
5:00 PM								
6:00 PM								
7:00 PM								
		1.0	1.0					
8:00 PM					2.0			
				2.0			2.5	2.5
9:00 PM						3.0		
10:00 PM								
11:00 PM								
					0.5	0.5	0.5	0.5
hrs / day	1.5	5.5	5.5	10.0	10.0	13.5	11.5	11.5

Aeration Schedule as of 11/13/2023

East Aerator (1)			West Aerator (2)		
On	Off	Total Hrs.	On	Off	Total Hrs.
6:00 am	7:30 am	1.5	5:30 am	8:30 am	3.0
			12:00 pm	3:00 pm	3.0
			6:30 pm	9:00 pm	2.5
		___	11:30 pm	2:30 am	3.0
Total aeration time		1.5			11.5

On-Site Visit - Progress Visit – 11/20/2023

On-site visit with Tracy Cole reviewing updated process control and lab analysis of Effluent TP, Effluent TN, and Effluent Nitrate. The current process control, and current NPDES compliance data were reviewed. Recommended new schedule, for rotor on – off aeration implemented on November 13, 2023, continues. Laboratory TN and TP grab sample results conducted on 11/20/2023 were TN 11.70 mg/L, and TP 1.00 mg/L. Ammonia NH^3 is 0.488 mg/L. The MLSS is 2900 mg/L and MLVSS is 1400 mg/l. The focus with the current process control is to keep TP below 1.0 mg/L and TN < 10 mg/L, while keeping a close eye on effluent Ammonia NH^3 compliance of <1.07 mg/L (winter limit monthly average). On-site laboratory analysis was conducted on 11/20/2023. The following are current results from the current process control:

On-site Effluent Grab Sampling – (11/20)
Eff Ammonia NH^3 : 0.488 mg/L
Eff Nitrate: 11.7 mg/l Eff. Nitrite: < 0.1 mg/L
Eff TP: 1.00 mg/L – (TNT Ortho method in TP reading)
Eff Alkalinity: <10 mg/L
Eff Ph: 6.93

Influent Grab Sample
Influent Alkalinity: 130 mg/L
Influent PH:7.2

Ditch Sampling – (11/20)
Ditch DO **when in ON-Aeration Cycle**: 5.0 mg/L
Ditch MLSS temperature : 16.4˚C
Ditch MLSS 2900 mg/L – 49% Volatile solids = MLVSS 1400 mg/L
Ditch PH : 6.9 S.U.
Ditch MLSS 30-minute Settleometer: 90 mL/L
Ditch SVI: 30 mL/g
Ditch F/M Ratio : 0.05 (Using Average Parameters)

After reviewing the current data, we plan to waste and lower the MLSS to around 2100 to increase the F/M to around 0.07 and increase the SVI. Although in winter months we normally tend to want a little higher MLSS compared to a Summer MLSS, we wanted to try to this to see what happens with Effluent TP. So, we will proceed with caution monitoring key parameters.

Dyer WWTP TNPOP Process Review

December 21, 2023

On December 21, 2023, I received updates from Tracy that in house on-site composite TP sample result was 1.1 mg/L and off-site contract lab TP results of 1.1 also. On/off aeration rates implemented on 11/13/2023 continue. The following is the contract lab results sampled on 12/05/2023.

Contract Lab Results – Samples (12/05)
Effluent TN: 9.14 mg/L
Effluent TP: 1.1 mg/L
Effluent Nitrate+Nitrite-N: 8.13 mg/L
Effluent Total Kjeldahl Nitrogen: 1.01 mg/L

Dyer 2024 TNPOP Progress Reports

Dyer WWTP TNPOP On-Site Process Review

January 05, 2024

On January 05, 2024, I met on-site with Trace and reviewed analytical reports, the aeration on/off cycle schedule implemented on 11/13/2023 and completed all monthly monitoring reports for EPA and State of Tennessee.

Dyer WWTP TNPOP Process Review

January 19, 2024

On January 19, 2024, I received updates from Tracy that the off-site contract lab TP results of 1.74. On/off aeration rates implemented on 11/13/2023 continue. The following are the contract lab results sampled on 01/05/2024.

Contract Lab Results – Samples (1/05/2024)

Effluent TN: 11.2 mg/L
Effluent TP: 1.74 mg/L
Effluent Nitrate+Nitrite-N: 10.2 mg/L
Effluent Total Kjeldahl Nitrogen: 1.01 mg/L

Dyer WWTP TNPOP On-Site Process Review

January 25, 2024

On January 25, 2024, I met on-site with Trace and reviewed analytical reports, process control, and the aeration on/off cycle schedule implemented on 11/13/2023. During January, several weather systems from heavy rains to extreme polar blasts caused problems with the process control. The Dyer wastewater system has experienced high flows from I/I, resulting in disruptions with the process control to reduce nutrients.

Dyer WWTP TNPOP On-Site Process Review

February 09, 2024

On February 09, 2024, I met on-site with Trace and reviewed analytical reports, process control, and the aeration on/off cycle schedule implemented on 11/13/2023. The process is stabilizing from upsets in January showing improvements in nutrient removal.

Dyer WWTP TNPOP Process Review

February 21, 2024

On February 21, 2024, I received updates from Tracy that the off-site contract lab TP results of 1.37. On/off aeration rates implemented on 11/13/2023 continue. The following are the contract lab results sampled on 02/08/2024.

Contract Lab Results – Samples (2/08/2024)

Effluent TN: 12.3 mg/L
Effluent TP: 1.37 mg/L
Effluent Nitrate+Nitrite-N: 10.3 mg/L
Effluent Total Kjeldahl Nitrogen: 2.01 mg/L

TNPOP Summary to Date, February 26, 2024

As Spring approaches with warmer temperatures, we plan to continue with the current process control and monitoring plan, adjusting if necessary. In the meantime, data regarding energy usage compared to previous years usage will be generated. By utilizing the State of Tennessee's TNPOP program allowed the Dyer WWTP personnel to adjust the process control in several configurations regarding aeration on-off cycles with different 2 rotors. In the past year, all parties involved learned the limitations of the process, equipment and design of the plant and at the same time learned what adjustments optimized the biological process control to achieve lower TN and TP.

Dyer WWTP TNPOP Process Review

February 29, 2024

After sending a progress report out the TDEC and Grant Weaver, On February 27, 2024, I received the following email from Grant.

DYER

I'm surprised Dyer isn't getting better total-Nitrogen removal.
Am I correct in understanding that Ammonia removal remains excellent while there continues to be room for improved Nitrate removal?
If so, less air-on time should help.
My suggestion: turn the air off from 2:00 AM to 6:00 AM.
Doing so will add ½ hour of air-off time in the morning before the daily samples are collected.
If, after a week, the Ammonia remains satisfactorily low and the Nitrate is still over 6, extend the air-off time to 6:30 AM.
If, after a week, the Ammonia remains satisfactorily low and the Nitrate is still over 6, extend the air-off time to 7:00 AM.
If, after a week, the Ammonia remains satisfactorily low and the Nitrate is still over 6, begin the air-off time at 1:30 AM so that the air-off cycle is 1:30 AM to 7:00 AM.
If, after a week, the Ammonia remains satisfactorily low and the Nitrate is still over 6, begin the air-off time at 1:00 AM.
If, after a week, the Ammonia remains satisfactorily low and the Nitrate is still over 6, begin the air-off time at 12:30 AM.

On February 29th, I emailed Tracy the following on/off aeration schedule and followed up with a phone call to discuss. Tracy Cole implemented the following schedule:

Aeration Schedule as of 02/29/2023

East Aerator (1)			West Aerator (2)		
On	Off	Total Hrs.	On	Off	Total Hrs.
6:30 am	7:30 am	1.0	6:00 am	8:30 am	2.5
			12:00 pm	3:00 pm	3.0
7:00 pm	8:30 pm	1.5	6:30 pm	8:30 pm	2.0
			11:30 pm	2:00 am	2.5
Total aeration time		2.5			10.0

Dyer WWTP TNPOP Process Review

April 08, 2024

On site visit with Tracy. This early morning, Tracy found the problem with the Dyer Plant that was causing high TN results. For the last 5 months a timer on the West aerator was not working properly to shut off the West rotor when called to do so during 2am - 6:30 am. It was discovered when Tracy was called out at 4am on an emergency call on (04/08/2024) and noticed the rotor running. So, that was the reason for the higher TN levels. We corrected the problem with the timer and within days the TN levels decreased from 9.0 to 4.0 and TP < 0.7. Test conducted yesterday showed BOD at <3.0 mg/L, Ammonia N at <0.3 mg/L, Nitrates <2.0 mg/L and TP <0.6 mg/L. On April 08, 2024, I met on-site with Tracy and reviewed analytical reports, process control, and the aeration on/off cycle schedule implemented on 02/29/2024. On April 2,2024, Total Nitrogen (TN) and Total Phosphorus (TP) were sampled and analyzed by contract lab. TN was 8.35 mg/L and TP was 0.815 mg/L. Grant Weaver's suggestions was reviewed and the ON/OFF aeration rates are planned to be modified on 04/09/2024 to the following schedule:

Aeration Schedule as of 04/09/2024

East Aerator (1)			West Aerator (2)		
On	Off	Total ON Hrs.	On	Off	Total ON Hrs.
7:00 am	8:00 am	1.0	6:30 am	8:30 am	2.0
			12:00 pm	3:00 pm	3.0
7:00 pm	8:00 pm	1.0	6:30 pm	8:30 pm	2.0
		__	11:30 pm	2:00 am	2.5
Total aeration time		2.0			9.5

On-Site Visit - Progress Visit – 04/18/2024

On-site visit with Tracy Cole reviewing updated process control and lab analysis of Effluent TP, Effluent BOD, Effluent Ammonia NH^3 and Effluent Nitrate. The current process control, and current NPDES compliance data were reviewed. Recommended new schedule, for rotor on – off aeration implemented on April 09, 2024, continues. Laboratory Nitrate and TP grab samples were conducted showing results of Nitrate 3.68 mg/L, and TP <0.50 mg/L. Ammonia NH^3 is 0.45 mg/L. The MLSS is 2415 mg/L and MLVSS is 1350 mg/l. The focus with the current process control is to keep TP below 1.0 mg/L and TN < 6 mg/L, while keeping a close eye on effluent Ammonia NH^3 compliance of 1.07 mg/L (winter limit monthly average). On-site laboratory analysis was conducted on 04/18/2024. The following are current results from the current process control:

On-site Effluent Grab Sampling – (04/18)
Eff Ammonia NH^3: 0.45 mg/L
Eff Nitrate: 3.68 mg/l Eff. Nitrite: < 0.1 mg/L
Eff TP: <0.50 mg/L – (TNT Ortho method in TP reading)
Eff BOD: 5.0 mg/L
Eff Alkalinity: 40 mg/L
Eff Ph: 7.20

Ditch Sampling – (04/18)
Ditch DO **when in ON-Aeration Cycle**: 2.29 mg/L
Ditch MLSS temperature: 18.4˚C
Ditch MLSS 2415 mg/L – 56% Volatile solids = MLVSS 1350 mg/L
Ditch PH : 7.0 S.U.
Ditch MLSS 30-minute Settleometer: 100 mL/L
Ditch SVI: 41 mL/g

With winter limits for BOD and Ammonia NH^3 coming to an end and summer compliance schedule limits of BOD (5.0 mg/L) and Ammonia NH^3 (0.84 mg/L) starting May 1st, the air on/off schedule may need to be updated to increase the air on schedule for the east aerator. After reviewing the current data, BOD and Ammonia NH^3 results is a concern and is the reason for adjustments on the

aeration schedule to adjust the process for summer compliance limits. The following new schedule was implemented on 04/18/2024.

Aeration Schedule as of 04/18/2024

East Aerator (1)			West Aerator (2)		
On	Off	Total ON Hrs.	On	Off	Total ON Hrs.
7:00 am	8:00 am	1.0	6:30 am	8:30 am	2.0
12:30 pm	1:30 pm	1.0	12:00 pm	3:00 pm	3.0
7:00 pm	8:00 pm	1.0	6:30 pm	8:30 pm	2.0
12:00 am	1:00am	1.0	11:30 pm	2:00 am	2.5
Total aeration time		4.0			9.5

On-Site Visit - Progress Visit – 05/07/2024

On-site visit with Tracy Cole reviewing updated process control and lab analysis of Effluent TP, Effluent BOD, Effluent Ammonia NH^3 and Effluent Nitrate. The current process control, and current NPDES compliance data were reviewed. Recommended new schedule, for rotor on – off aeration implemented on April 18, 2024, continues. Laboratory Nitrate and TP grab samples were conducted showing results of Nitrate <2.0 mg/L, and TP 0.60 mg/L. Ammonia NH^3 is 0.25 mg/L. The focus with the current process control is to keep TP below 1.0 mg/L and TN < 6 mg/L, while keeping a close eye on **effluent Ammonia NH^3 compliance of 0.84 mg/L (summer limit monthly average) and effluent BOD compliance of 5.0 mg/L**. The plant is performing well and meeting the TNPOP goals! Contract laboratory results conducted on 05/02 and on-site laboratory analysis conducted on 05/07/2024 are as follows:

Contract Laboratory Results – Composite Sampled on 05/02/2024

Effluent TN: 5.21 mg/L
Effluent TP: 0.606 mg/L
Effluent Nitrate+Nitrite-N: 4.53 mg/L
Effluent Total Kjeldahl Nitrogen: 0.683 mg/L

On-site Effluent Grab Sampling – (05/07/2024)

Eff Ammonia NH^3: 0.25 mg/L
Eff Nitrate: < 2 .00 mg/l Eff. Nitrite: < 1.0 mg/L
Eff TP: 0.60 mg/L – (TNT Ortho method in TP reading)
Eff BOD: 2.5 mg/L
Eff Alkalinity: 120 mg/L
Eff Ph: 7.20

Ditch Sampling – (04/18)

Ditch DO **when in ON-Aeration Cycle**: 2.00 mg/L
Ditch MLSS temperature: 21.0 C
Ditch MLSS 3900 mg/L – 56% Volatile solids = MLVSS 2184 mg/L
Ditch PH : 7.0 S.U.

On-Site Visit - Progress Visit – 06/07/2024

On-site visit with Tracy Cole reviewing updated process control and lab analysis of Effluent TP, Effluent BOD, Effluent Ammonia NH^3 and Effluent Nitrate. Recommended new schedule, for rotor on – off aeration implemented on April 18, 2024, continues. Laboratory Nitrate and TP grab samples were conducted showing results of Nitrate 3.36 mg/L, and TP 0.85 mg/L. Ammonia NH^3 is 0.26 mg/L. The focus with the current process control is to keep TP below 1.0 mg/L and TN < 6 mg/L, while keeping a close eye on **effluent Ammonia NH^3 compliance of 0.84 mg/L (summer limit monthly average) and effluent BOD compliance of 5.0 mg/L**. The plant continues to perform well and meeting the TNPOP goals! Contract laboratory results conducted on 06/03 and on-site laboratory analysis conducted on 06/07/2024 are as follows:

Contract Laboratory Results – Composite Sampled on 05/02/2024

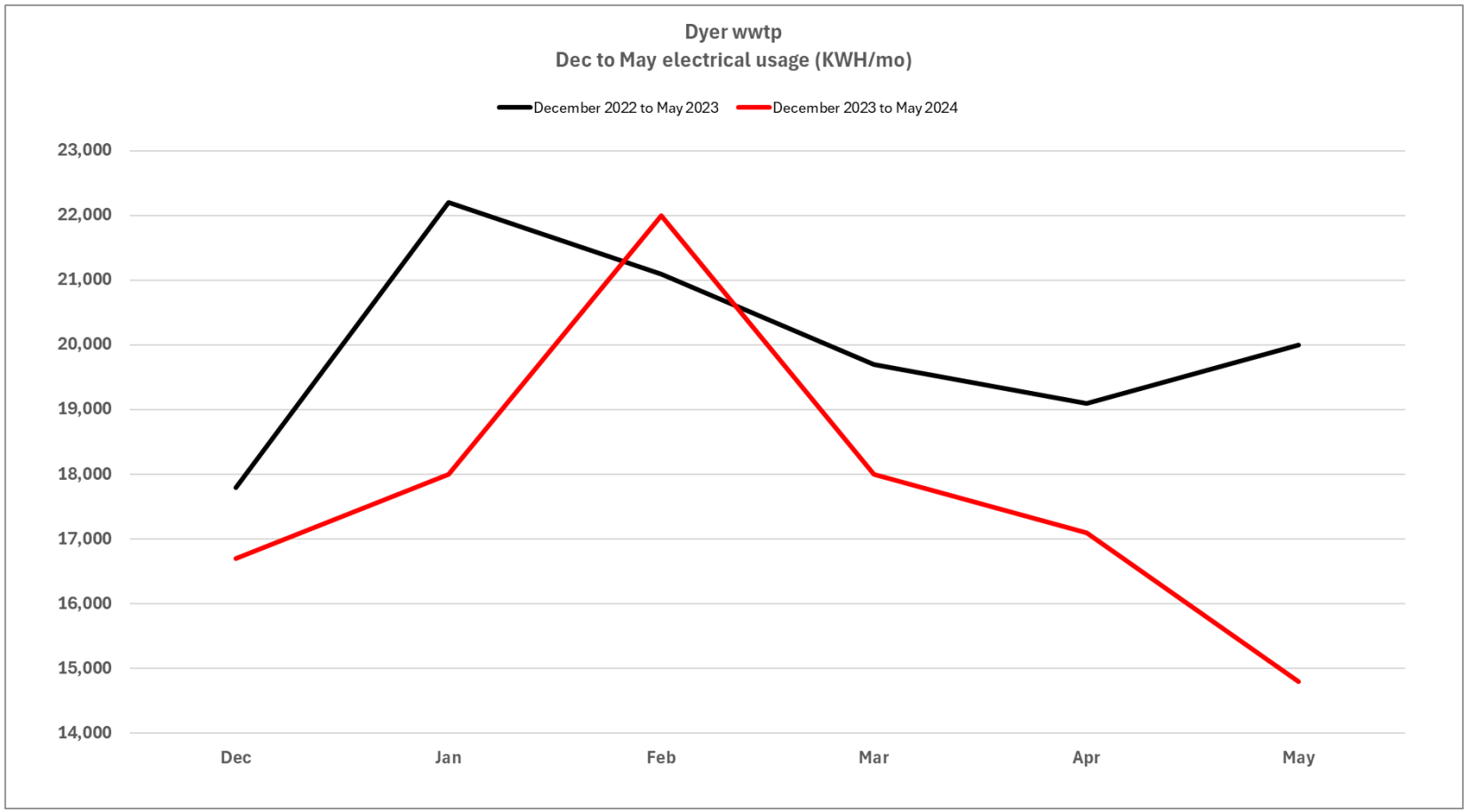
Effluent TN: 3.63 mg/L
Effluent TP: 0.733 mg/L
Effluent Nitrate+Nitrite-N: 2.42 mg/L
Effluent Total Kjeldahl Nitrogen: 1.21 mg/L

On-site Effluent Grab Sampling – (05/07/2024)
Eff Ammonia NH^3: 0.26 mg/L
Eff Nitrate: 3 .36 mg/l Eff. Nitrite: < 1.0 mg/L
Eff TP: 0.85 mg/L – (TNT Ortho method in TP reading)
Eff BOD: 2.6 mg/L
Eff Alkalinity: 120 mg/L
Eff Ph: 7.20

Ditch Sampling – (04/18)
Ditch DO **when in ON-Aeration Cycle**: 1.5 mg/L
Ditch MLSS temperature: 24.0 C
Ditch MLSS 3500 mg/L – 50% Volatile solids = MLVSS 1750 mg/L
Ditch PH : 7.1 S.U.

Electrical Usage

The billing report that follows provides a two-year history of electrical use at Dyer's municipal wastewater treatment plant. Following a series of adjustments to the aeration rotor run times, by project end plant staff were able to find "sweet spots" for winter and summer operations. The graph below illustrates the ten percent reduction in KWH hours for the six-month period of December 2023 to May 2024 relative (red line) to that of the same period one year earlier (black line).



BILLING REPORT

Account: **4046-012**
Name: DYER CITY OF
Address: 105 S MAIN ST DYER TN
Zip: 38330
Service Address: 199 BECTON ST Meter: 13941733
Connect Date: 04/20/82

System Date/Time	Type	Net KWH	Bill Amount
05/02/24	NORMAL	14800	1517.14
04/02/24	NORMAL	17100	2028.75
03/04/24	NORMAL	18000	2091.97
02/02/24	NORMAL	22000	2582.30
01/03/24	NORMAL	18000	1946.65
12/04/23	NORMAL	16700	1952.93
11/02/23	NORMAL	16700	1689.70
10/03/23	NORMAL	16200	1543.36
09/05/23	NORMAL	18200	1798.89
08/02/23	NORMAL	17400	1769.78
07/05/23	NORMAL	17400	1696.61
06/02/23	NORMAL	18300	1833.31
05/02/23	NORMAL	20000	1859.45
04/04/23	NORMAL	19100	2189.45
03/02/23	NORMAL	19700	2418.25
02/02/23	NORMAL	21100	2491.43

01/05/23	NORMAL	22200	2584.73
12/02/22	NORMAL	17800	1974.53
11/03/22	NORMAL	16700	1901.26
10/04/22	NORMAL	16400	1757.57
09/02/22	NORMAL	15300	1918.88
08/02/22	NORMAL	16200	1844.40
07/05/22	NORMAL	15800	1978.69
06/02/22	NORMAL	15700	1661.50